PORTLAND HARBOR RI/FS

BACKGROUND DOCUMENT: HOT SPOTS IN THE PORTLAND HARBOR FEASIBILITY STUDY

--FOR DISCUSSION DRAFT

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HOT SPOTS IN THE PORTLAND HARBOR FEASIBILITY STUDY

The LWG looks forward to meeting with ODEQ May 10. We hope the information in this memorandum provides useful information on the following topics we plan to discuss at the meeting:

- The draft FS approach to identifying potential hot spots based on the Oregon rule
- Challenges to applying the Oregon hot spots rule directly to the Portland Harbor Superfund Site
- Why, under any approach to hot spot identification, the alternatives proposed in the draft FS address potential hot spots consistent with the Oregon rule

A. Purpose of the Oregon Hot Spot Rule

Oregon's Environmental Cleanup Law requires selection of a remedy that "assures protection of present and future public health, safety and welfare and of the environment." ORS 465.315(1)(a). As between protective remedies, Oregon law requires selection of the least expensive remedy, unless a more expensive remedy is justified by "proportionately greater" short or long term protectiveness, implementability and reliability. ORS 465.315(1)(d)(E). Where a "hot spot" of contamination is present, a higher threshold is applied to evaluate the reasonableness of the costs of treating or removing the "hot spot." *Id*.

First and foremost, the remedy must be protective. A higher cost remedy is <u>only</u> preferable under Oregon law if it provides proportionately greater protectiveness. A more expensive remedy that is <u>less</u> protective of present and future human health and the environment would never be preferred under Oregon law, even if it results in a higher volume of treatment or removal.

The Portland Harbor draft Feasibility Study (FS) evaluated eleven different remedial alternatives. The draft FS demonstrates that those alternatives that integrate in-place technologies with dredging are more protective than those alternatives that rely primarily on extensive dredging, and that those alternatives that focus active remediation on areas of higher sediment concentration are more protective than those alternatives that attempt to address broad areas of lower concentrations. The draft FS concludes that there are no "proportionately greater benefits" to the more expensive alternatives evaluated in the draft FS.

Alternatives B-i and C-i are designed to target the areas of highest sediment concentrations. Alternative B-i proposes treatment or dredging in 86 percent of actively remediated areas, and Alternative C-i proposes treatment or dredging in 82 percent of actively remediated areas. However areas of "hot spots" might be defined at Portland Harbor, the two alternatives that score highest in the draft FS are those that move quickly to address the areas of highest sediment contamination, primarily through treatment and removal.

B. Draft FS Approach to Hot Spot Identification

The Oregon statute defines soil or sediment hot spots as hazardous substances that are present in high concentrations, are highly mobile or cannot be reliably contained, and that would present a risk to human health or the environment exceeding acceptable risk levels. ORS 465.315(2)(b)(A). The rules define "hot spots" as meeting any one of the three criteria: (1) high concentrations; (2) highly mobile; or (3) not reliably contained.

1. "Not Reliably Contained"

The draft FS concludes that there are not any "not reliably contained" hot spots at Portland Harbor. The capping effectiveness and stability modeling evaluation summarized in Section 6.2 of the draft FS indicates that all sediments at the Site are reliably containable through one or more types of capping technologies that are commonly applied to sediment sites. We understand from LWG's March 15, 2012, conference call with ODEQ, ODOJ and EPA that ODEQ agrees with this conclusion.

2. "High Concentration"

The draft FS also concludes that there are no "high concentration" hot spots in Portland Harbor. As discussed in the draft FS, the evaluation was complicated by the fact that the Site risk assessment proceeded based on EPA guidance and direction rather than under Oregon's regulation and guidance.

First, the conservative assumptions used for certain exposure scenarios in the risk assessments result in risk estimates that potentially exceed a 10^{-4} cancer risk sitewide. For example, the EPA-identified total PCB RG for whole body smallmouth bass fish consumption at the 10^{-4} cancer risk is 29.5 μ g/kg. The harborwide surface area weighted average concentration (SWAC) for total PCBs is ~84 μ g/kg, and the SWAC for each full river mile exceeds the RG. It is simply not helpful to identify the entire 11-mile Study Area as a hot spot. And this would not be the outcome of a risk assessment performed under Oregon law, which would be based upon reasonably likely exposure assumptions, such as a fillet consumption scenario.

Second, the Portland Harbor risk assessment evaluated total PCBs. Oregon rules are very clear that hot spot identification must be based on the risk presented by individual, rather than summed, chemicals. OAR 340-122-0115(32)(b)(A)(i), (ii) and (iii) define "high concentration" hot spots based on multiples of concentrations exceeding acceptable risks levels for "each *individual* carcinogen," "each *individual* noncarcinogen," and "each *individual* hazardous substance." It is clear from the ODEQ rulemaking that these references to "individual" contaminant risk levels were directly tied to Oregon's statutory acceptable risk levels for individual contaminants (i.e., for human health, lifetime excess cancer risk of one per one million

for individual carcinogens and an exposure resulting in a hazard quotient of 1 for individual noncarcinogens).¹

Under ODEQ's Human Health Risk Assessment Guidance (October 2010), risk evaluation should be applied at the congener level whenever that data is available:

DEQ applies the individual chemical acceptable risk level of 1 x 10-6 to individual CDD/CDF congeners and dioxin-like PCB congeners, and the 1 x 10-5 acceptable cumulative risk level to multiple congeners. If the analysis is only for total PCBs (*e.g.*, Aroclors), DEQ will apply the 1 x 10-6 acceptable risk level to the total PCB concentration. This is because the majority of the risk posed by the mixture may be due to one congener. *Id.* at 17.

Thus, at a site like Portland Harbor, where individual chemical/congener data is available, the 1 x 10-6 individual carcinogen risk level should be applied where it is intended, to the individual chemicals/congeners. Because hot spots are based on multiples of the relevant acceptable risk

[T]he primary trigger is risk – are any of the *individual* contaminants present at risk-based concentrations of greater than one excess cancer for every 10,000 exposures? The protectiveness standard in statute and rule is one in one million for each *individual* contaminant, so the hot spot threshold is 100 times the acceptable risk level. The proposed rules also have thresholds for non-carcinogenic risk and ecological risk. ODEQ Memo to EQC, Agenda Item C, Environmental Cleanup Amendments; EQC Meeting on January 10, 1997 (December 23, 1996).

ODEQ's Guidance for Identification of Hot Spots, April 23, 1998 ("ODEQ Hot Spot Guidance") affirms this derivation of the high concentration hot spots based on risk levels for individual contaminants. ODEQ explains in its guidance that highly concentrated hot spots are determined "by comparing the concentration of each *individual* site contaminant to its 'highly concentrated' hot spot level." *Id.* at 12 (emphasis added). ODEQ also notes that "[t]he 'highly concentrated' hot spot levels should not be mistaken as representing site risk since they do not consider the cumulative exposure from multiple contaminants or the contaminant distribution throughout the site." *Id.* The guidance is also clear that it only applies to individual non-carcinogens: "Although the Environmental Cleanup Rules use hazard indices for defining the acceptable risk level, hazard quotients must be used in deriving 'highly concentrated' hot spots levels for *individual* non-carcinogens since a hazard index is only applicable to cumulative effects of multiple contaminants." *Id.* at 13, n. 11 (emphasis added).

¹ In ODEQ's summary of the rule for the Oregon Environmental Quality Commission, ODEQ focused on the risk presented by "individual contaminants":

levels, the hot spot multiples of those risk levels should also be applied to the individual chemical and congener concentrations.²

The draft FS attempts to address the intent of the hot spot rule by evaluating several approaches for identifying areas of "high concentration" that might correspond to hot spots. These approaches are explained in detail in section 5.5.1.1 and Table 5.5.1 of the draft FS. As explained there, each of the approaches evaluated has limitations and inconsistencies with respect to application of Oregon rules. The approach that is most consistent with both the Oregon hot spot rule and guidance focuses on individual contaminants and the exposure pathways primarily responsible for unacceptable risk--PCB 126 and 2,3,4,7,8 PCDF for cancer and non-cancer endpoints from human consumption of smallmouth bass fillets on a river mile SWAC basis (FS Section 5.5.1.1.3). The result of that evaluation is that no "high concentration" Oregon hot spots are identified.

3. "Highly Mobile"

The draft FS also concludes that there are no "highly mobile" hot spots within Portland Harbor. This was a two step evaluation. The first step compared existing surface water sample results on a point-by-point basis to potential ARARs identified by EPA. The second step compared the concentrations of the contaminants identified through that screening step to background surface water concentrations defined in the draft final RI. This comparison showed that, for those chemicals that exceeded the screening levels, surface water background levels exceed one or more potential ARARs such that the beneficial use of the surface water entering the Site is already "significantly adversely affected." The draft FS therefore concludes that any action in the Site is not reasonably likely to restore or protect such beneficial use, and the Site therefore does not fit within the definition of a highly mobile hot spot in OAR 340-122-0115(32).

² In several recent records of decision (RODs), ODEQ has used the concentrations of individual chemicals or congeners, rather than the total concentration of a family of chemicals, to define hot spots. For example, at the United States Postal Service – Processing and Distribution Center (USPS-P&DC) site, ODEQ defined hot spots based on the concentrations of individual PAHs, rather than Total PAHs. ODEQ, USPS-P&DC ROD, pp. 13-15 (July 14, 2010). ODEQ also identified hot spots at the PacifiCorp Youngs Bay Property based on concentrations of individual PAHs. ODEQ, PacifiCorp Youngs Bay Property ROD, p. 17 (September 2010). Similarly, at the Owens Brockway Glass Container Inc. Site, aka Johnson Lake, ODEQ identified a potential sediment hot spot based on carcinogenic risk for human consumption of fish from the lake driven by the most toxic PCB congener present, PCB-126. ODEQ, Johnson Lake ROD, p. 10 (October 2007). Of course, a responsible party may always conclude that, for site-specific reasons, it is more cost-effective to collect data summed by chemical family or class and use that data conservatively to identify potential high concentration hot spots. We are aware that, at the Zidell site, PCB data were collected based on Aroclors rather than congeners and high concentration hot spots were identified based on multiples of acceptable risk levels based on Aroclor sums.

During a March 15 conference call, DEQ suggested that "highly mobile" hot spots should be identified by screening modeled transition zone water concentrations, rather than surface water concentrations. As a starting point, there is no legal basis, or any precedent, under Oregon law for applying Oregon Water Quality Standards as set forth in OAR 340-041-0033 to pore water. Those standards are enacted under the subchapter of Oregon's water quality statutes applicable to "Surface Water." ORS 468B.048. See also Umatilla Waterquality Protective Association, Inc. v. Smith Frozen Foods, Inc., 962 F. Supp. 1312, 1315-16 (D. Or. 1997) (finding Oregon law distinguishes between regulation of surface water versus groundwater). Under Oregon law, pore water, even in the transition zone, falls under the definition of groundwater. The Oregon cleanup rules, which specifically inform the definition of "hot spot" just five paragraphs later in the rule, define groundwater to include any water under a body of surface water:

"Groundwater" means any water, except capillary moisture, beneath the land surface or beneath the bed of any stream, lake, reservoir or other body of surface water within the boundaries of the state, whatever may be the geological formation or structure in which such water stands, flows, percolates, or otherwise moves. OAR 340-122-0115(27).

Pore water in sediments is located beneath the bed of the water body and is therefore defined as groundwater under the Oregon rules.

ODEQ acknowledges that pore water is groundwater, not surface water, under Oregon law in its Internal Management Directive for the Disposal of Municipal Wastewater Treatment Plant Effluent by Indirect Discharge to Surface Water via Groundwater or Hyporheic Water, September 2007 ("ODEQ Indirect Wastewater Discharge IMD"): "Under this IMD, hyporheic water [pore water]⁵ is categorized as groundwater instead of surface water." *Id.* p. 1, n.2. The IMD does not apply surface water quality standards to pore water, specifying instead that "[t]he surface water quality standards contained in OAR 340-041 will apply to the indirectly discharged treated wastewater once it reaches surface water" and that "these requirements [surface water quality standards] should be evaluated at the interface of the waste management area and the receiving stream." *Id.* at 2 and 8. To assess whether surface water quality standards will likely be met in the receiving water body, "[g]roundwater monitoring within the waste management area at or near the discharge point to surface water may be included to confirm design

⁴ Because the Oregon hot spot rule is being evaluated as a potential state ARAR, any assessment of effects relative to surface water quality standards must be evaluated by looking at those standards as they are applied under Oregon law, even if EPA has a different approach to the application of the federal ambient water quality criteria from which many of the Oregon standards are derived.

⁵ Hyporheic water is defined as "the water in saturated sediments under or beside a stream channel or floodplain that contributes water to a stream. Hyporheic flow is the subsurface flow that transitions between groundwater and surface water and can extend landward of the surface water body." ODEQ, Indirect Wastewater Discharge IMD, p. 1, n.2.

assumptions are true, permit effluent limits are adequate, or for other operational purposes (i.e., *detection monitoring* instead of *compliance monitoring*)." *Id.* at 13 (emphasis in original).

In determining the significance of pore water concentrations in characterizing hot spots from an ARAR perspective, the Oregon cleanup statute and rules are the starting point. A highly mobile hot spot occurs under the Oregon hot spot rule if the hazardous substance is present at a level exceeding the acceptable risk level and is reasonably likely to migrate to such an extent so as to result in a "significant adverse effect on beneficial uses of water...for which treatment is reasonably likely to restore or protect such beneficial uses within a reasonable time, as determined in the feasibility study." OAR 340-122-0115(32)(b)(B), as it refers to OAR 340-122-0115(32)(a).

To be considered "highly mobile" under the rule, the hazardous substance has to move from one medium to another. The notes of the ODEQ work group that drafted the hot spot rules makes clear this was the intent:

DEQ recommends that 'high mobility" be defined as the potential migration to additional environmental media to such an extent that a hot spot could be created in the additional environmental media.

Memorandum from Jeff Christensen and Kevin Parrett to External Remedy Selection Technical Workgroup, April 24, 1996, Attachment 1, p. 3 (emphasis added). As an example of migration from one medium to another that could lead to a determination of a "high mobility" hot spot in soil, the ODEQ Hot Spot Guidance discusses the leaching of rainwater through the soil medium into the groundwater medium to create an unacceptable risk to the drinking water beneficial use of groundwater. ODEQ Hot Spot Guidance, Figure 3-3.

The media discussed in the ODEQ Hot Spot Guidance are groundwater, surface water, soil, drummed waste and contaminated debris, sediments, sludges and non-aqueous phase liquids. *Id.* at 2. Pore water is not a separate medium. As explained in the guidance, "[f]or the purposes of characterizing sediment hot spots, the definition of sediments also includes the associated pore water." *Id.* at 17.

Because the ODEQ Hot Spot Guidance is clear that pore water is considered part of the sediment, it is not appropriate to consider the "migration" of contamination from the theoretical dry weight sediments into pore water as a migration pathway that could lead to identification of a high mobility hot spot. It is appropriate, however, to consider whether hazardous substances can migrate from the bulk sediment, including both the sediment and pore water, to surface water in deciding whether there is a "highly mobile" hot spot in the sediment. The guidance explains that "'highly mobile' hot spots can be present in sediments if contaminants are likely to leach out of the sediments and move into the surface water at concentrations that would cause a significant adverse impact on the use of the surface water." *Id.* at 17. Although using pore water may be convenient for screening purposes, a full application of the "highly mobile" hot spots criteria requires an understanding and appropriate application of the Oregon surface water quality

standards (i.e., spatial and temporal application to the underpinnings of the surface water standards) to the surface water itself, not the pore water.³

Even if leaching from sediments could cause an adverse impact on a beneficial use of the surface water, a "highly mobile" sediment hot spot only exists if "treatment is reasonably likely to restore or protect such beneficial uses within a reasonable time, as determined in the feasibility study." OAR 340-122-0115(32). The Portland Harbor Feasibility Study addresses this specific question in section 5.5.1.3. It evaluates both existing surface water chemical concentrations in the Site and upstream background surface water concentrations against Oregon water quality standards to determine whether there is any evidence of a significant adverse impact on the beneficial uses of the surface water that could be restored within a reasonable time through treatment. It concludes that the upstream surface water entering the Site is already "significantly adversely affected." Thus any action in the Site is not reasonably likely to restore or protect such beneficial use. Because of this fact, even if hazardous substances were migrating to surface water from Site sediments, the sediments could not fit within the definition of a highly mobile hot spot in OAR 340-122-0115(32).

Finally, even if highly mobile hot spots could be defined under Oregon law based on a comparison of TZW concentrations to surface water standards, such highly mobile hot spots would be adequately addressed by either (1) upland source control or (2) remediation of highly concentrated hot spots. Upland source control activities involving the treatment and/or removal of contaminated groundwater would address any highly mobile hot spots resulting from the migration of contaminated groundwater to the surface water. This approach is consistent with the Portland Harbor remedial action objective relating to human health risks from groundwater, which indicates that "groundwater plumes will be controlled to achieve ARARs and risk-based remediation goals through upland source control actions." Draft FS, Appendix B: EPA September 30, 2009 Remedial Action Objectives Letter (March 30, 2012).

It is difficult to define hot spots based on impacts associated with discharge of contaminated stormwater since the impact of the discharge on the receiving body is complicated by the need to model how those contaminants are deposited and accumulate in the river and biological receptors. As documented in Section 7.3, several removals have been conducted at the site to address contamination that was highly concentrated or mobile. These actions and the implementation of end-of-pipe treatment for the majority of facility stormwater are considered to meet the criteria of treating or removing site hot spots for the purposes of the stormwater evaluation. Evraz Stormwater ROD, pp. 20-21 (December 2010).

³ In the Stormwater Source Control Measures for the Evraz Oregon Steel Mills Site ROD, ODEQ observed that identification of hot spots based upon the mobility of contamination in stormwater to sediments or surface water is properly based upon "how those chemicals are deposited and accumulate in the river and biological receptors":

Any highly mobile hot spots resulting from the migration of clean groundwater through contaminated sediment would be addressed by the remediation of the associated highly contaminated hot spot in sediment. The Guidance supports this approach:

Furthermore, it may not be necessary to derive "highly mobile" hot spot levels if such levels would clearly exceed (i.e., be less conservative than) any "highly concentrated" hot spot levels derived for the site. In such cases, the expense and effort to calculate site-specific "highly mobile" hot spot levels would not [affect] the size of the hot spot which would be controlled by the lower (more stringent) "highly concentrated" levels. ODEQ Guidance, p. 15.

Thus, even if there were highly mobile hot spots at the Site, they would be adequately addressed by the combination of upland source control measures relating to groundwater and the evaluation of the potential highly concentrated hot spots. Under these circumstances, the Guidance does not require a detailed evaluation of highly mobile hot spots.

C. Evaluation of Treatment or Removal in the Draft FS

Although the draft FS concludes that no hot spots are likely present, sections 8 and 9 of the draft FS evaluate each alternative in the context of identifying the relative highest concentration areas and volumes and evaluating the cost-effectiveness of dredging or treating those areas and volumes. Each Alternative from B-i to F-r assumes physical removal, or a combination of removal and treatment, of a majority by acreage of sediments exceeding the respective remedial action levels (RALs). As shown in Table 9.0-1 to the draft FS, Alternative B-i applies in-situ treatment or dredging as the remedial action for a combined 86 percent of that footprint and Alternative F-i applies in-situ treatment or dredging in a combined 75 percent of SMA acreage, thus clearly applying a preference for treatment or removal to these areas of the highest PCB concentrations.

No approach to identifying potential Oregon hot spots would result in proportionately greater risk reduction for the cost involved or is feasible given the greater short term risks associated with physical removal of such very large volumes of sediment across so many areas of the Site. Thus, although no Oregon hot spots were identified, the intent of the rule (i.e., application of a preference for treatment or removal) is met through the analysis of the draft FS.

D. Conclusion – the Draft FS Adequately Addresses Hot Spots as Required under Oregon Law

Oregon's Environmental Cleanup Law requires the application of a higher threshold to evaluate the reasonableness of the cost of a remedy that is more protective with respect to hot spots. Under Oregon law, hot spots are defined by contaminants that are present at significantly elevated levels (highly concentrated), contaminants that are reasonably likely to migrate into other media (highly mobile), or contaminants that are not reliably containable. The Oregon Environmental Cleanup Rules and ODEQ guidance indicate that highly concentrated hot spots

are defined by concentrations of individual contaminants or congeners, not families of chemicals, and that highly mobile hot spots are defined by the likely migration of contaminants from one medium into another. Highly mobile hot spots affecting surface water are only present where a potential remedy would be reasonably likely to restore or protect beneficial uses.

The draft FS applies Oregon law to identify hot spots and evaluate potential remedies based on a higher threshold for the reasonableness of costs associated with remedies that are more protective with respect to hot spots. The draft FS concludes that there are no "not reliably contained" hot spots because all sediments are reliably contained by capping; no highly concentrated hot spots based on an evaluation consistent with Oregon's environmental cleanup law of the exposure pathways primarily responsible for unacceptable risk; and no highly mobile hot spots because no action at the Site would be reasonably likely to restore or protect beneficial uses of surface water.

Nonetheless, the basic structure for each of the alternatives (Alternatives B-i through F-r) includes physical removal, or a combination of removal and treatment, of a majority of sediments with the highest concentrations (i.e., exceeding RALs) identified for active remediation in every alternative. By treating or removing the areas of highest concentration, the intent of the Oregon hot spot rule is addressed, because any potential highly concentrated sediment hot spots are treated or removed, and treating or removing those areas of high sediment concentration also addresses potential mobilization of contamination to surface water by the migration of TZW through contaminated sediments. Potential adverse impacts to surface water from contaminated groundwater migrating through the transition zone into surface water should be addressed by upland source control.

Again, a higher cost remedy is <u>only</u> preferable under Oregon law if it provides proportionately greater protectiveness. The Portland Harbor draft FS demonstrates that those remedial alternatives that integrate in-place technologies with dredging are more protective than those alternatives that rely primarily on extensive dredging, and that those alternatives that focus active remediation on areas of higher sediment concentration are more protective than those alternatives that attempt to address broad areas of lower concentrations. However "hot spots" might be defined at Portland Harbor, the draft FS establishes that the most protective alternatives for the site are those that move quickly to address the areas of highest sediment contamination, primarily through treatment and removal.